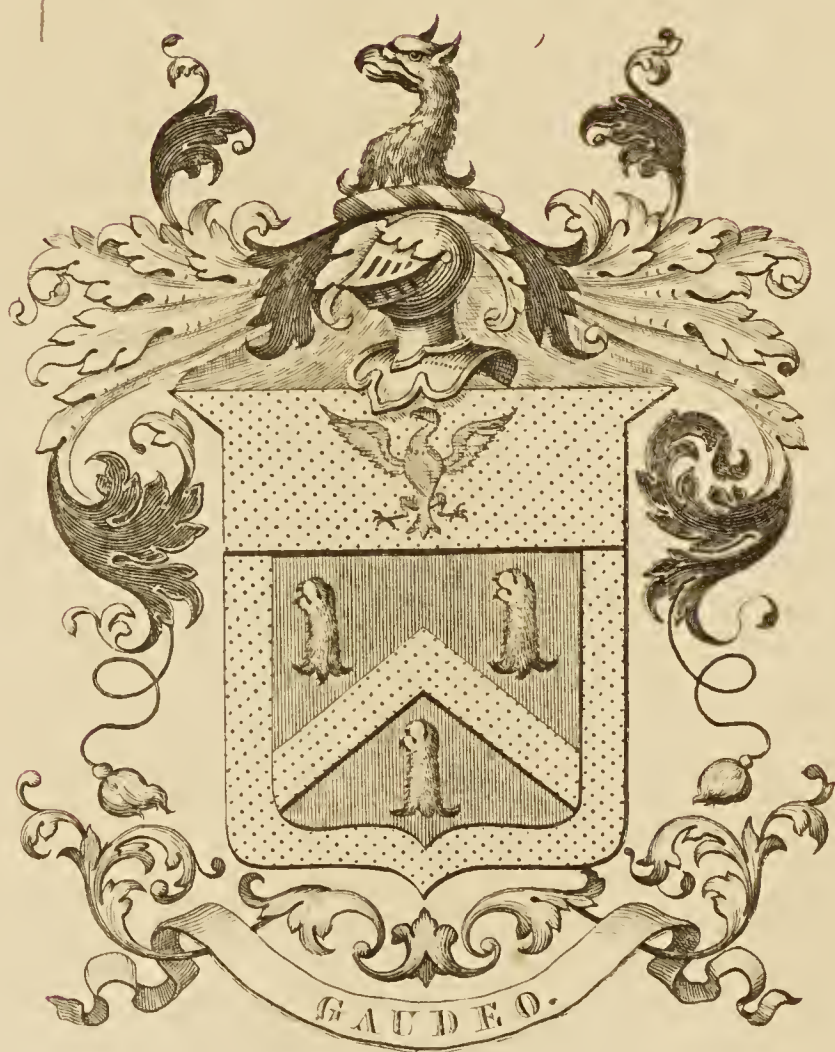




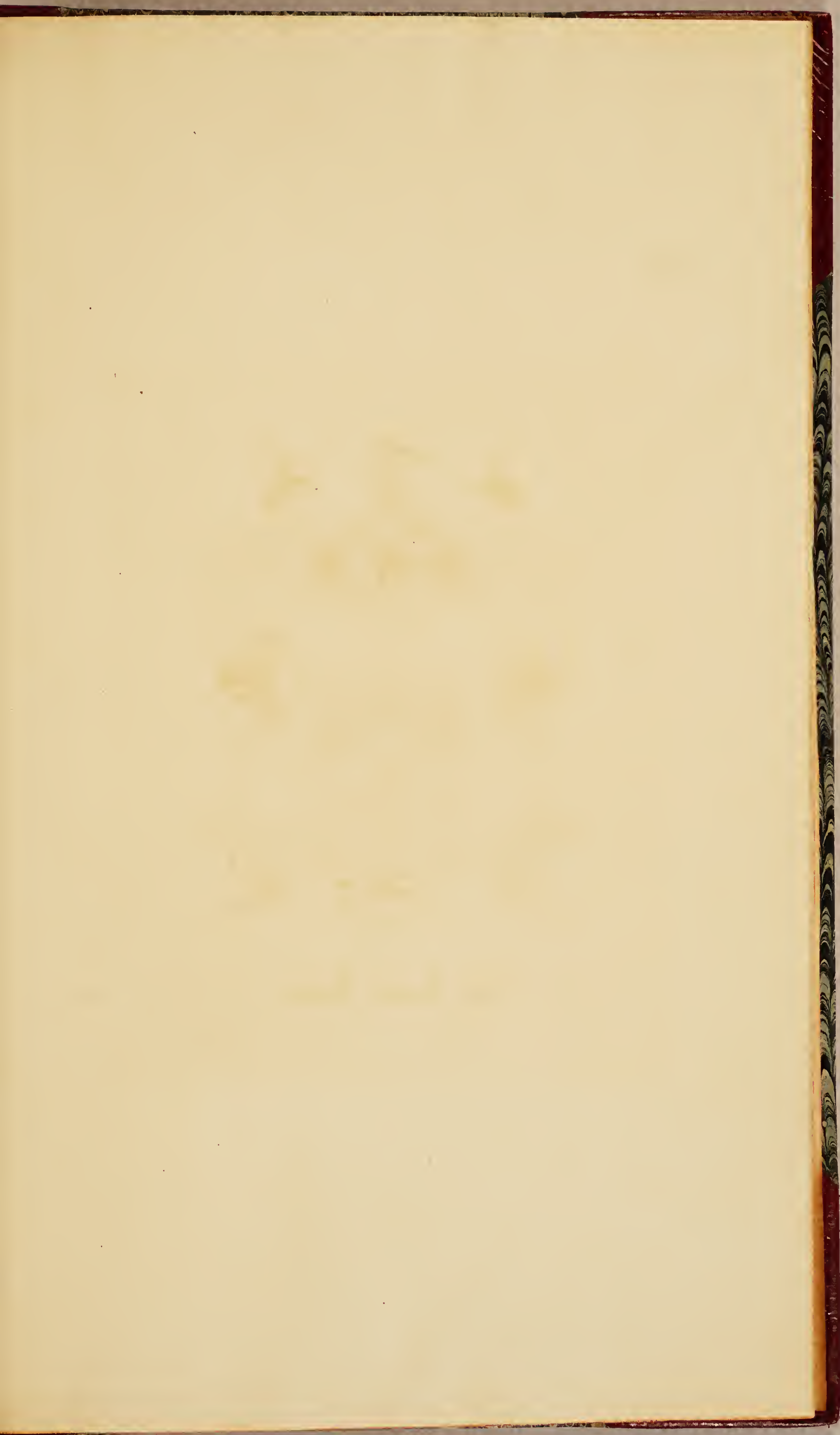
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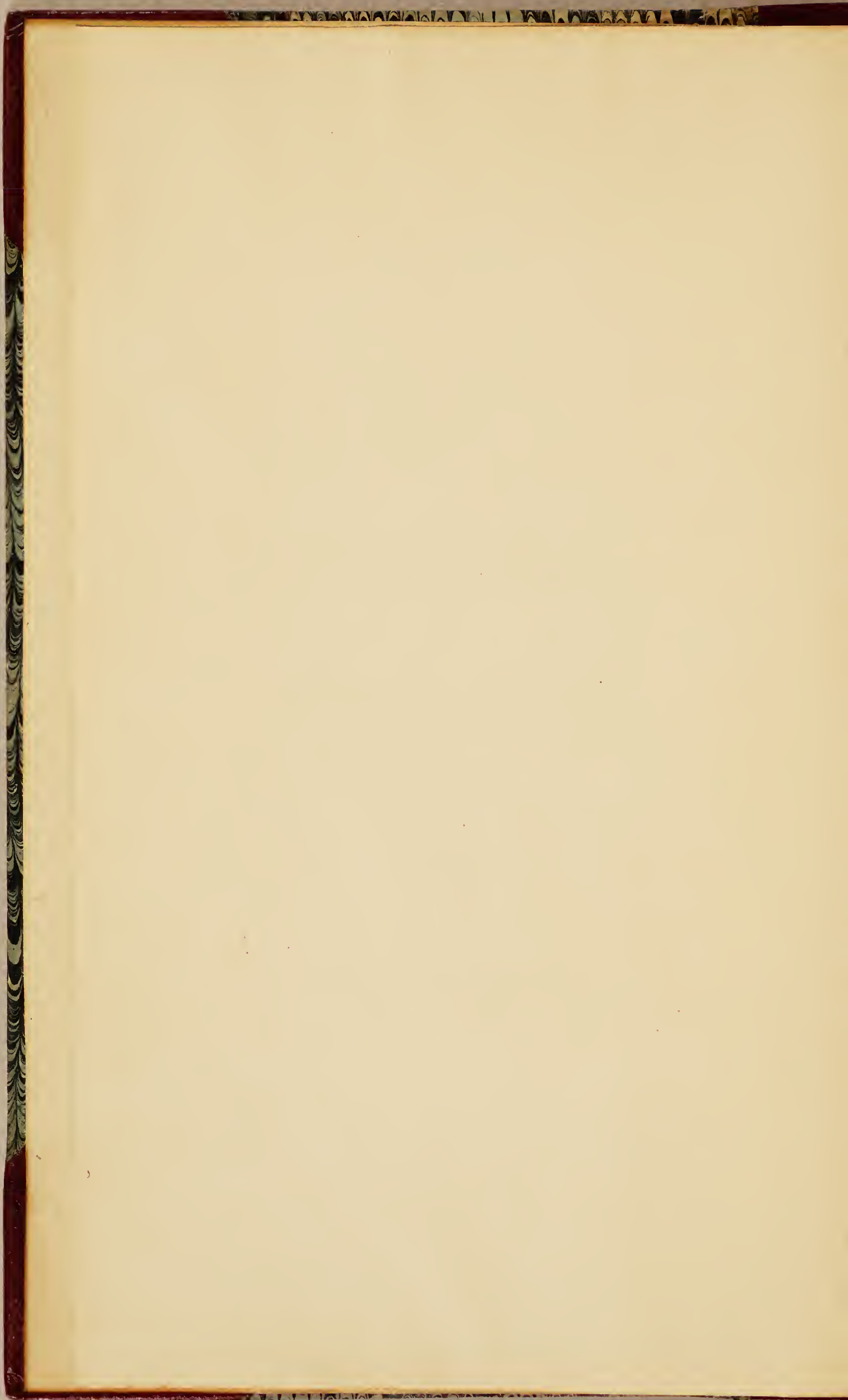
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Antique Book

R.158

under the same name

OBSERVATIONS

ON THE

Pot-Ash brought from America.

WITH RESPECT TO ITS

GOODNESS, SOPHISTICATION, &c.

Verified by Experimental Examination:

TOGETHER WITH

INSTRUCTIONS for determining the comparative
Value of any Parcel, by expedient Methods:

To which, is subjoined,

PROCESSES for making POT-ASH and
BARILLA, in North-America.

The whole communicated to the

SOCIETY FOR THE ENCOURAGEMENT OF ARTS,
MANUFACTURES AND COMMERCE,

BY R. DOSSIE:

And printed, at their Request, in Consequence of an Application made to them on these Points, by the Hon. House of Representatives of the Province of MASSACHUSETTS-BAY.

LONDON. MDCCCLXVII.

JOHN CARTER BROWN.

RPJCH

OBSERVATIONS

ON THE

POT-ASH

BROUGHT FROM

AMERICA, &c.

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OBSERVATIONS
ON THE
POT-ASH
BROUGHT FROM
AMERICA; &c.

THE AMERICAN ALKALI, as prepared by the evaporation of the ley in vessels, according to the process published by the London Society for the Encouragement of Arts, &c. in their premium-book for the Colonies, though at present called POT-ASH, is not in reality of the same kind with the *pot-ash*, properly so named, made in Europe: but is, when the process has been rightly conducted, a pure fixt alkaline salt, free from any heterogeneous matter: which the European pot-ash, as it is made by evaporation of the ley in the naked fire, can never be.

The *alkali* prepared by evaporation in vessels, as directed in the process given by the Society, is, however, the only kind, that ought, at present, to be made in our American colonies, to be sent to the British markets. For alkali, produced in the manner of the European pot-ash,

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though it may serve for making coarser kinds of sope, and some other purposes ; yet can never be pure enough to be substituted for *pearl-ash* in cleansing raw cottons, or bleaching linnen ; in the composition of the finer kinds of sope or glass ; in dying ; or in many other uses ; as the good American alkali has been : and, consequently, it can never bear the advanced price, to which the best American has been raised : though the contingent expence of freight, package, &c. would be as great on one, as on the other. Whence, as the manufacture of real pot-ash, such as the European, would not answer by far so well, either with respect to the makers in America, or to the public demand here, as the kind sent at present, if well prepared, it should not be encouraged.

I have given the name of *American alkali*, to the kind made according to the Society's process : as it differs from any other, at present, produced elsewhere ; and is that, which is generally, if not wholly, now brought from America. It were to be wished, moreover, that this name should in general, be adopted for it ; and that of *pot-ash* discontinued ; in order to distinguish it from the European pot-ash, and from *pearl-ash*, to which it is, when well prepared, much nearer in its qualities. This distinction of the names of the two kinds is very expedient : as not only the method of preparation, appearance, and uses of them, vary, in some respects:

spects: but the American sort is now a different article of commerce from the European; and must be judged of, as to its goodness and value, by a different standard of examination.

The American alkali, duly prepared, containing but little earthy, oily, or sulphureous matter, except what enters into the constitution of the alkaline salt itself, is white, semi-crystalline, and dissolves easily and perfectly in water, without imparting any colour to the fluid; or without depositing any sediment, but a little quantity of white earth; which is only a small proportion of *Magnesia Alba*, that is always separated from the vegetable fixt alkaline salt on its solution in water. This is the appearance of it, when perfectly good: and some considerable quantities of such have been brought to England from the American manufactories: as is evinced by specimens produced to the Society, in claim of the premium offered for pot-ash.

These appearances will always be found in the American alkali, when perfectly pure, in consequence of the process being rightly conducted in every point. But there may be failures in, and deviations from, the process, that will occasion a want of them in a more perfect degree; and yet not deprave the salt in so material a manner, but that it may be deemed good in a marketable sense; as it will be still fit for all the greater uses, to which alkaline salts are applied.

The appearance of the alkali, under these circumstances, will be that of a less chrystalline, and more flaky texture; and of a more dusky white colour, with some marbling of grey: or of an entire grey colour. It will be more difficult of solution; and will deposit a greater quantity of sediment, of a greyish or brownish hue; but the solution itself will still be colourless. This may be accounted the second rate kind; and is not much inferior in value to the first: because it may yet be used for bleaching, &c. But when these appearances are wholly wanting, the alkali is unfit for bleaching, dying, &c. and it will then be opaque; of a dark grey, or reddish brown colour, or variegated with both; stony in its texture; difficult to be dissolved in water, without being previously powdered; and will deposit a considerable quantity of dark grey, brown, or blackish sediment.

Besides the faultiness of the American alkali, that may be caused from the ill management of the process, another depravity may happen from the properties of the vegetables, whence the ashes employed for making it are obtained. For some vegetables do not afford alkaline but neutral salts: and others a proportion of both. In general this neutral salt is vitriolated tartar; or, in other words, has for its basis the vegetable alkali: but, in some few instances, it is *sal mirabile*; or, in other words, has a fossile alkaline basis.

basis. Where vegetables yielding these neutral salts in a large proportion happen to be used, such neutral salts will be mixt with the alkaline, and consequently be so much foreign or heterogeneous matter in the prepared alkali.

Adulterations, also, may be purposely made, by the addition of lime, chalk, or other white earths; or by common salt.

The faultiness of the American alkali, that may arise from ill management of the process, is reducible, with respect to the cause, to four irregularities, or neglects in the process.

The first is, *the suffering some of the charcoal, or parts of the vegetables not perfectly calcined, to be put into the dissolving vat, or steeper, with the ashes*, from the negligence of not freeing them from the small bits that are apt to be intermixt with them. This imparts a proportion of the fixt sulphur of the vegetable matter to the ley; and renders the alkali corrosive, and discoloured, if a very strong and continued heat be not given to it after the evaporation.

The second is, *the suffering some parts of the unburnt vegetables to be in like manner put into the vats, along with the ashes*. This happens from the same neglect, as the first: and, as many vegetables contain tinging juices, a staining matter is thus imparted to the alkali, if great heat be not used after the evaporation. The same kind of depravity happens from parts
of

of the vegetables imperfectly burnt, which deprave the ley with an empyreumatic oil, that will also tinge linen, &c; and is in some degree corrosive.

The third is, *the suffering part of the ashes to be drawn off with the ley into the evaporating vessels.* When the ashes are free from any bits of wood, or coal, this only adds a quantity of foreign, or heterogeneous matter to the alkali, but does not deprave it any other way. It is, therefore, of much less consequence than the other kinds of faultiness.

The last, and most general, is, *the not giving a due heat to the alkali, after the water is evaporated:* in consequence of which, a proportion of the fixt sulphur of the coal attracted in the incineration, even if the ashes be ever so clean, will remain; and render the alkali foul and corrosive: or, if there be any tinging matter, or empyreumatic oil, it will not be destroyed or driven off; but cause a tinging, or even in some degree, corrosive quality. It must be observed here, that this corrosive sulphur keeps the alkali in a fluid state, where the quantity under operation is large, for a considerable time, sometimes more than twenty-four hours, after the water is wholly evaporated. The mass has then a blackish brown, tar-like appearance; and will remain thus fluid even though the bottom of the vessel be red-hot: but if the heat be continued,

nued, the sulphur will, at length, be consumed, or driven off; and the alkali will become white, grey, or marbled; and solid. In some of the American manufactories, this part of the process, which regards the purifying the salt from the sulphur, by the continuance and strength of the heat, after the evaporation, is called, though improperly, *fluxing*; alluding to Mr. Stevens's process, where a fluxing heat was really used; but it ought rather to be called *calcining*. This circumstance of the calcination seems not duly understood in most of the American manufactories. But where there is a neglect of it, the alkali will be in proportion discoloured, stony, difficult of solution, and corrosive: or, if the heat be great in the lower part of the caldron, and weak at the top, or the middle, the tinging, or corrosive matter will be expelled from the hotter part, and driven thither; and render the salt unequally depraved; as is found in many parcels. As this kind of faultiness renders the alkali unfit for the use of bleachers, and callicoe printers, on which both the advanced price, and consumption depend, it is the point, that should be most attended to, either with respect to the interest of the colonies, or the improvement of commerce here, as far as relates to this article.

The sophistication either by sea-salt, or by earthy substances, when not in a very considerable

vable degree, is less injurious than the depravity owing to the corrosive sulphur: as they do not injure the alkali in like manner for bleaching, and some other of the most important purposes. But as they add to the weight, without contributing to the effect, it is so far a fraud on the purchaser, where intentionally made: and the practice of such an abuse ought to be prohibited. Too much rigour should not, however, be used in this point: as some proportion of sea-salt is unavoidable in the ashes burnt for domestic purposes: and some quantity of the earthy part of the ashes will be apt to find its way where the ley is not carefully drawn off. Allowance should therefore be made in these particulars; especially where the other kind of depravity renders the alkali fit only for coarser purposes; and brings it under a different consideration with respect to marketable value.

It does not appear, on examining the specimens of different parcels of the American fixt alkali, which have come to my hands, as well those sent to me by the Society, as a number of others procured elsewhere, that any of them are sophisticated with lime, chalk, or *intentionally* with sea-salt; or any other way *purposely* adulterated by additions. But it is evident, that most of them are in a greater, or less degree, depraved with the corrosive sulphur, or tinging matter of the vegetables whence they

they were obtained, by the ill management in their preparation, with respect to the impurity of the ashes, or neglect of due heat in the calcination ; and also that they contain some sea-salt, or other neutral salt, which may be accidentally in the ashes from various exterior causes ; or the nature of the vegetables whence they were produced.

This depravity by the corrosive and tinging matter is, therefore, the principal object of the present examination, and remedy. But, as it is possible, artificial adulterations may be hereafter practised, it is proper to have some provisional regard to the means of detecting them also.

The appearance of any parcel of the American alkali, and of a solution of some portion of it in water, gives great light into the qualities of such parcel. If the alkali itself be *transparent* in a greater or less degree ; of a white, or very light grey colour ; and dissolve in water without giving the least tinge to it, and with a small proportion of sediment ; a presumption may be formed, that it will not corrode or stain linnen ; and that it can have no fault, except the containing some neutral salt, which will not do any injury, but that of taking up the place of the alkali ; and diminishing the real proportion of it in any quantity.

If it be *opaque*, but yet white, or a light grey ; and do not colour the water in which it is dissolved, but deposit a considerable quantity

of sediment ; the same may be concluded with respect to its use, as in the preceding case : though the opacity, and too great quantity of sediment, which must be ascribed to some kind of earthy matter, shew an adulteration of that kind.

But if, on the other hand, it appear of a very dark grey, blackish, or brown colour, or variegated with black or brown ; be of a hard stony texture ; and colour the water, in which it is dissolved ; it should be rejected for the use of bleachers, callico-printers, and dyers ; and deemed of an inferior kind : as it cannot be substituted for pearl-ash ; nor bear a correspondent price.

The appearance of the alkali cannot, however, be wholly depended on, as a criterion of the degree of its goodness. For there may be some adulteration under the resemblance of such as is good : and, on the contrary, there may be a less good look, in such as is not faulty. It is proper, therefore, to have recourse, in many cases, to experiment for a decision. And the adulterations by earthy substances, that will not dissolve in water ; or by salts which will ; require each a different means of examination : as does, also, the more material faultiness, owing to the caustic sulphur, and tinging matter.

The depravity owing to the caustic sulphur, may be discovered by trials on linnen cloth or thread ; or by precipitations with acids, or alum :
but

but with most accuracy by its effect in tarnishing silver: which trial may be, with great ease and certainty, made by the method below directed.

The best means of examining whether there be any sophistication by earthy insoluble matter, of the kinds above-mentioned, is, by making a solution of a small portion of the parcel in question; and observing whether or no there be any considerable quantity of sediment, after having suffered the solution to stand at rest, or filtered it. And it may be further discovered what proportion such sediment bears to that of the best American alkali, by a comparison of the specific gravity of the solution of a stated portion of such parcel with a correspondent solution of that of the best. It is known, by accurate trials, that the best kind, being dissolved in eight times its weight of water, adds a twelfth part to the specific gravity of the fluid; or, in other words, the specific gravity of such a solution, when free from all the feculence, or indissoluble parts, is to simple water as thirteen to twelve. This may, therefore, be taken, as a standard proportion; and nothing then remains, but to make a similar solution of a quantity of such as is under examination; and determine its comparative specific gravity with that of water by a proper hydrometer, in the most simple way: which may, with the greatest ease, be performed in the manner hereafter directed.

The proportion of saline matter being thus

ascertained, it may be distinguished, whether the whole be alkaline salt, by adding lime, and evaporating the fluid till only about equal parts of the salts and water remain ; and then suffering it to stand at rest till the neutral salt, if there be any, shoot at the bottom of the vessel: which will happen in a short time. It must be remarked, nevertheless, that though the purest American alkali will, when dissolved in eight times its weight of water, add a twelfth to the specific gravity, yet considerable allowance may be made, as to a defect in this point, provided there be no other depravity ; since the adulteration by substances, that will not dissolve in water, does not injure the alkali for bleaching, or several other important purposes ; but only renders a greater quantity requisite to be used.

The adulteration by sea-salt may be detected by the taste ; and, also, by chrySTALLIZATION : for both which trials, the methods below given seem the most certain and commodious.

If it be further desired, on perceiving too great a proportion of earthy or insoluble matter, by the appearance of sediment in the solution ; or by finding the specific gravity defective, in such solution, by means of the hydrometer ; to know whether the sophisticating matter be lime, chalk, or the ashes of the vegetables themselves ; it may be done by washing the sediment ; and then adding oil of vitriol copiously diluted with water : which will dissolve the
ashes,

ashes, if the sediment be of that kind ; but will not dissolve the lime, or chalk. A method for performing this is, therefore, below subjoined.

To distinguish accurately, if the American alkali be free from the faultiness owing to the caustic sulphur.

“ TAKE a tea-spoonful of the alkali bruif-
 “ ed, or grossly powdered. Add, to it, about
 “ six of the same spoonfuls of water : and, af-
 “ ter stirring them for some time, put into the
 “ fluid, a silver *spatula* ; and stir the mixture with
 “ it. If the alkali contain any caustic sulphur,
 “ the silver will be tarnished ; and appear dull,
 “ and tinged with orange, brown, purple, or
 “ green. When the alkali contains a large pro-
 “ portion of the sulphur the effect will be im-
 “ mediately produced ; but, when only a small
 “ quantity, it will require a longer time : on
 “ which account, the *spatula* should be suffered to
 “ continue some minutes in it. A tea-spoon may
 “ be used instead of a *spatula*. But, where an
 “ instrument is frequently wanted for such pur-
 “ pose, the form of a *spatula* is most conveni-
 “ ent ; as being more easily cleansed from the
 “ tarnish : it being requisite, in this view,
 “ the silver should be bright, and have its co-
 “ lour pure. The most easy method to free the
 “ silver from the tarnish, contracted in this ex-
 “ periment, is to rub it with a piece of soft lea-
 “ ther, sprinkled with wet chalk, or whiting.”

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This method is as accurate as it is easy: for it will shew every degree of the corrosive quality of the alkali, owing to the caustic sulphur.

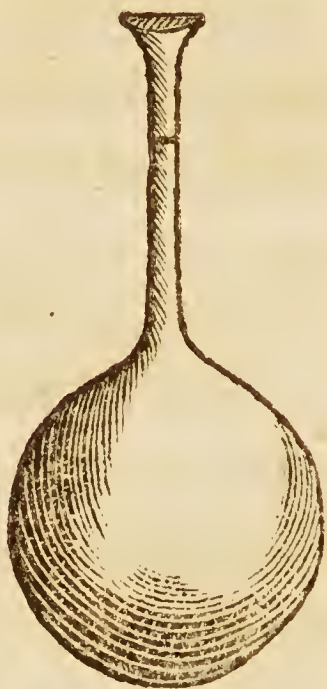
To distinguish, by an hydrometer, in what proportion the alkali is adulterated with ashes, chalk, lime, or other insoluble earthy matter.

“ THIS is best done by examining the specific gravity which a stated portion of any parcel under examination gives to water, compared with that of such as is known to be good.

“ The best American alkali, as prepared under the name of pot-ash, is known by experiment, as was above observed, to add, on being dissolved in eight times its weight of water, a twelfth part to the specific gravity; which may, therefore, be deemed a standard proportion. And an hydrometer of a simple form, that will contain an exact known quantity of pure water, will, on being filled with such a solution of the alkali under trial, shew by the correspondence, or defect of the weight, the just degree of the earthy adulteration, if there be any.

“ The most expedient hydrometer for this purpose is a round glass bulb, with a long narrow neck widening in the trumpet fashion at the end, made, nearly as possible, to hold half an ounce of water.

“ The



“ The difficulty of making a glass bulb, that
 “ will hold exactly half an ounce of water, is
 “ the reason for directing the neck to be long;
 “ and the end of it is to be wider, in the trum-
 “ pet fashion, that the fluid may be more easily
 “ conveyed into the hollow of the bulb. The
 “ neck should be marked by the scratch of a
 “ diamond, or by other means, exactly in the
 “ place to which the half ounce of water, when
 “ put into it, rises : and, in order to adjust this,
 “ the hydrometer must be nearly filled with
 “ pure water, and being wiped dry, must be
 “ accurately weighed; the other scale being
 “ charged with the exact weight of the glass,
 “ before the half ounce for determining the
 “ volume of the water be put in. The quan-
 “ tity of the water in the bulb is then to be
 “ diminished or augmented, till it weigh ex-
 “ actly half an ounce : and the mark must be
 “ put on the place of the neck to which it rises.
 “ The hydrometer, being thus prepared, must
 “ be

“ be used for the trial of any parcel of alkali
 “ under examination, in the following manner.

“ Take half an ounce of the alkali to be exa-
 “ mined; and powder it. Add, to it, four ounces
 “ of boiling hot water: and stir them well to-
 “ gether till the salt be dissolved; and nothing
 “ remain but a fine powder. Let the solution stand
 “ to settle: and afterwards pour off as much of
 “ the clear fluid into the hydrometer, as will fill
 “ it to the proper height: that is, to the part
 “ of the neck which is marked.

“ It will appear then, on trial, whether the
 “ solution be of the standard weight with that
 “ of the best American pot-ash: or, in other
 “ words, whether it weigh half an ounce and
 “ one scruple: which is the gravity of a quan-
 “ tity of such solution that occupies the same
 “ volume with half an ounce troy weight of
 “ water. If the alkali be defective in salt, the
 “ weight will be proportionably less: and, ac-
 “ cording to the number of grains in which it
 “ is so found to be less, it may be estimated
 “ to be so many thirtieth parts defective. This
 “ method, properly performed, will be practi-
 “ cally, though not philosophically accurate;
 “ and is, in fact, less subject to error than any
 “ of the more complex means of proceeding
 “ devised for such purpose.”

*To distinguish the adulteration of alkali by sea-salt,
or other neutral salts.*

“ AN adulteration by sea-salt, in such
 “ proportion as to be of any material injury
 “ to the value of the alkali, may be distin-
 “ guished by the taste, in a weak solution, if
 “ compared with one of the same strength of
 “ such alkali as is pure. The solution, made
 “ as directed above, for trial with the hy-
 “ drometer, mixt with an equal part of water,
 “ may serve for this purpose; and another
 “ similar solution of alkali, which is known
 “ to be free from sea-salt, may be kept ready for
 “ the comparison.

“ The more accurate method of distinguish-
 “ ing, if there be any sea-salt, or other neutral
 “ salt, with the alkali; and what the proportion
 “ or kind of it may be; is, by crystallization
 “ with the help of lime, to render the real alka-
 “ line salt caustic, and consequently more solu-
 “ ble in water; by which means it is prevented
 “ from shooting along with the sea-salt, or
 “ other neutral salt.

“ This may be expediently performed in
 “ the following manner:

“ PUT an ounce of the alkali, and an equal
 “ weight of lime, into six ounces of boiling
 “ water. Let the mixture stand for some time:
 “ and then, having decanted, or filtered off the
 “ clear solution, evaporate till it be wasted

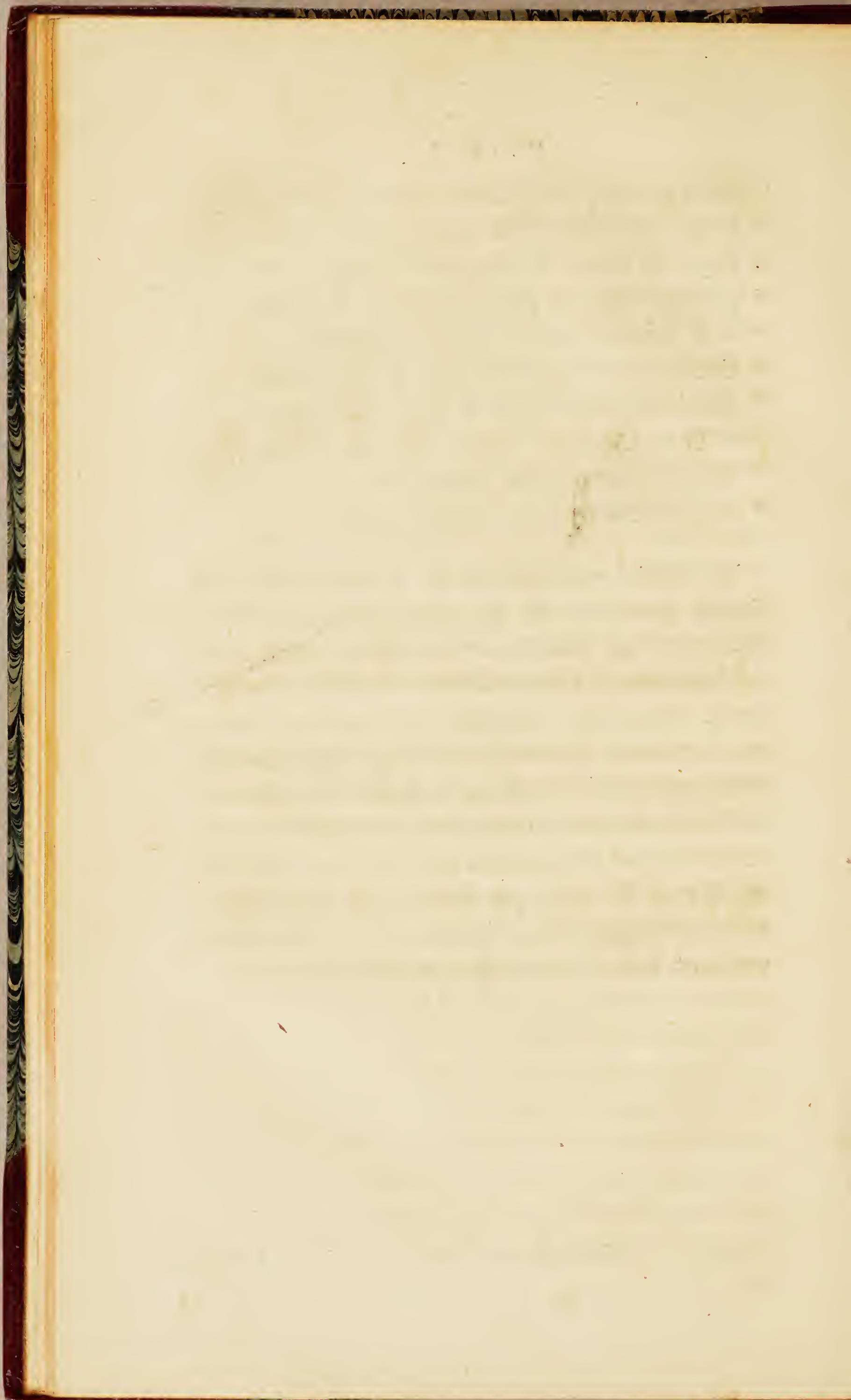
“ three-fourths. Let it stand to cool: and the
 “ neutral salt will shoot; and give the opportu-
 “ nity of examining, by the form; taste, &c.
 “ of the chrystals, whether it be sea-salt, vitrio-
 “ lated tartar, or *sal mirabilis*. This trial not
 “ only determines the species, but even to mo-
 “ derate exactness, the proportion of the neutral
 “ salt to the real alkali. But it must be under-
 “ stood, that there is always a small propor-
 “ tion of semivitrified salt, and vitriolated tar-
 “ tar, in all solutions of alkali, when first lixi-
 “ viated from the ashes; for which allowance
 “ must be made, even in those parcels which
 “ are obtained from the best ashes, and with
 “ the most accurate conduct of the process.”

*To distinguish whether the earthy matter in the
 American alkali, be the ashes of the vegetables;
 or chalk or lime intentionally added.*

“ POWDER a small quantity of the alkali
 “ suspected: and put, to it, six or eight times
 “ its weight of boiling water. Stir the mixture
 “ about till the salt be dissolved; and then filter
 “ off the fluid through paper: adding fresh
 “ water several times to the sediment, in the
 “ paper, to carry off the remaining part of the
 “ dissolved salt. Put the sediment then into a
 “ tea-cup, or small drinking-glass: and pour
 “ into it, by degrees, oil of vitriol diluted with
 “ about eight or ten times its weight of water,
 fo

“ so long as any ebullition follows : waiting some
 “ little time after the addition of each quan-
 “ tity. If there be no earthy matter, but the
 “ proper ashes of the vegetables, the sediment
 “ will wholly dissolve, and disappear. But if
 “ there be any chalk or lime, it will remain un-
 “ dissolved; and retain its form and appearance.
 “ This affords a certain means of detecting
 “ the adulteration by chalk, lime, or any earth
 “ not soluble by the vitriolic acid.”

By these methods, well understood, and
 rightly practised, all the faults of any parcel of
 the American alkali may be distinguished; and
 the intentional adulterations detected. But it
 seems extremely requisite at present, that a
 more general knowledge of the right conduct
 of the process for making it should be diffused
 in North America. Otherwise, though the adul-
 terations and depravities may be thus discover-
 ed, they will not be prevented: as they seem to
 arise principally from ignorance, in that point;
 and not from the design of sophistication.



P R O C E S S E S

F O R M A K I N G

Pot-Ash, and Barilla,

I N

N O R T H A M E R I C A.



P R O C E S S

FOR MAKING

P O T - A S H

I N

NORTH AMERICA.

POT-ASH is the fixt alkaline salt, produced, along with the earthy part of the ashes, in the burning vegetable substances of most kinds; and it may, consequently, as is more particularly explained in the foregoing observations, be either in a pure state, or mixt with the earthy part of the ashes, the burnt oil and fixt sulphur of the vegetables, or other substances.

The pot-ash may therefore be of two sorts; *the one*, such as is in a great degree free from those heterogeneous substances or impurities; *the other*, such as abounds more with them, so as to be depraved for some purposes. Both these sorts are, however, proper to be made in America, as different circumstances admit.

The one should be denominated FINE POT-ASH; or rather, for reasons given in the foregoing observations, *fine American* ALKALI: and
should

should be so free from the burnt oil, or other impurities, as to be fit for cleansing and bleaching linnen and cotton; and some other uses where purer kinds of fixt alkaline salt are required. This sort, as it may be substituted for another kind of alkaline salt, called *pearl-ash*, for several such uses, will consequently bear, as mentioned in the preceding observations on American pot-ash, *page 2*, a much higher price in proportion, than that which is not so pure as to serve for these purposes: and when the wood is burnt intentionally for making pot-ash, it may be prepared of this degree of goodness, with very little more expence than the worst kinds.

The other sort may be denominated COARSE POT-ASH; or *coarse American* ALKALI: and though it will not bear the price of the fine, it will, nevertheless, always find a market at some rate, in proportion to its greater or less degree of impurity. As there are uses for which great quantities of alkaline salts are consumed, that do not require they should be fine; but even admit of their being very coarse, provided they be very cheap.

The *apparatus* for making either the *fine* or *coarse* pot-ash, according to this process, are the same; and should consist of these instruments and utensils.

Vessels; or *steepers*, as they are called; for dissolving the alkaline salt: which may either be round
tubs

tubs or casks, or square vats. They may be made of the best white pine, cypress, or white oak. If they be round, they should be well secured with iron hoops; or, if square, with an oaken frame. They may be about four or five feet in depth; and of any diameter, or width, according to the occasion there may be, with relation to the quantity of wood-ashes proposed to be used for making the pot-ash. These dissolving vessels, or steepers, must have a kind of false bottom, formed by making a sort of lattice-work, or grate, of boards placed, with the edge upwards, cross each other: so that the space or area betwixt them, may be about five inches square, and eight inches deep. The cavities, or hollows formed by these boards, must communicate with each other freely, by holes cut in the lower edge, where it rests on the real bottom: and a vent must be made on the same level, from the outside of the vessel, into one of these spaces, by means of a cock, in order to draw off the fluid they may contain.

A receiver or trough for the ley, while drawing off from the steepers: which may be any kind of wooden vessel, that can be conveniently placed under the cock; and will hold the ley, as it runs out.

Vats for containing, and keeping the strong ley, till the time of evaporation; or *the weak ley*, till it can be put upon fresh ashes, for rendering it of due strength. They may be large square vats,
E
casks,

casks, or any other kind of vessel that is tight, and will hold the due quantity.

In the German works, square vats of a middling size are used as steepers : and a number of them are placed close to each other in a row, with a trough of the length of the whole, for conveying water into them, at will, by means of cocks. Another such trough is, likewise, placed under them, to take the ley when discharged from cocks inserted at the bottoms of the steepers; and convey it to large vats, set on a proper level to receive it.

Large *evaporating caldrons*, or *pans*, which may be either of cast or hammered iron, according to the convenience of obtaining them to be made.

When caldrons of cast iron are used, they should be as large as they can be procured to be made : and should be of a round form; twice as wide as they are deep; and with a rim at the edge, to rest on the brick-work of the furnace for their support. They should be set without any flue or worm round them, at about eighteen inches from the grate or bars of the fire-place : and the sides of the furnace must be carried round the caldron at three or four inches distance, and closed in, under the rim of the pot, with one course of bricks. The fire-place, and the rest of this furnace, may be made in the same manner, as those of common coppers for washing, or brewing ; except the omission of the
the

the worm or flue round the pot: instead of which, the whole area of the furnace is to be left hollow, and the vent for the smoke to be made at the back part of it, immediately under the course of bricks which closes in the pot.

When pans of hammered iron are used, they may be fabricated, and set in the same manner as salt-pans for making table salt. Or, in other words, they may be oblong pans with flat bottoms, formed of iron plates well rivetted and welded together. Their depth may be a foot, or a foot and an half; and their magnitude, in other respects, must be adapted to the largeness of the intended work. The fire-place should be at one end; and the heat carried under the pan by a flue of the whole breadth of it; and vented into a chimney at the further extremity, by an opening of the width, of about one-third of the breadth of the flue.

Caldrons for drying and calcining the salt. These should be of cast iron only; of a figure nearly cylindrical, or tapering in a small degree downwards with a round bottom. They should be narrower than the evaporating caldrons, where those are very large, by about two-thirds of the diameter: and the depth should be twice as much as their own diameter. The thickness of the iron should be an inch at the bottom: but the upper part may be thinner. These should be set in the same manner as the evaporating caldrons.

In smaller works, especially of the coarser pot-ash, one caldron of a middle proportion, betwixt the evaporating and calcining, may be made, to serve for both purposes. But, in larger works, there is a great advantage in the use of two different kinds of caldrons. Because the size and form of the less kind renders the action of the heat much more effectual and quick in its operation, in bringing the salt to a due state of purity from the burnt oil, or sulphur, than those of the larger: while they, on the contrary, are much better accommodated to the evaporation of the water from the salt; and will much more commodiously expedite that part of the process.

When the vessels for evaporating and calcining are carried from England to America, or are to be obtained there, only from some other distant place, it is extremely proper to have duplicates of both kinds of the caldrons, or even three of the lesser. For it is necessary to have another always ready to supply the place of such as may become unfit for use. As the bottom of both cast and hammered iron caldrons or pans sometimes unexpectedly fail in particular parts, when exposed to a strong heat: and if another were wanting to replace any that should so fail, it would occasion a total stop to the work, till a new one could be procured.

A *strong iron rod*, longer than the depth of the caldrons or pans, and flattened at one end, in the manner

manner of a broad chisel, for loosening the alkaline salt from the bottom of the caldron, during the evaporation.

An *iron ladle* for taking out the salt; or cooling the ley, if it tend to boil over the caldron.

A *strong broad iron chisel*, with a *wooden mallet* for cutting the salt out of the caldron, when the whole operation is completed.

An *iron rake*, with *close teeth*, for separating the bits of unburnt wood or coal from the ashes.

A *pair of small scales*, with *two phials*, for trying the strength of the ley, in order to know if it be fit for evaporation.

The pot-ash may either be made from the ashes of wood burnt on purpose: or from those which are obtained by consuming wood, or other parts of vegetables, for domestic or common uses. The wood may be of any kind usually burnt, except that of ever-green, or other trees, which abound in turpentine: as firs, pines, &c.

Whenever trees are intentionally burnt for the making pot-ash, it should be attempted to produce the finest sort: and the manner of burning the wood, and preparing the ashes for forming the ley, may be as follows:

In large works, the wood for making the ashes, may, in dry weather, be burnt on the naked ground: and it is there of great consequence, to practise the most proper manner. In such cases, the wood may be cut into logs of
any

any magnitude, that is most convenient for carrying or rolling them along: and they should be laid on a very dry firm spot of ground, in the manner of a pile, in which the greatest hollows that can be made, should be left betwixt them. These hollows should be filled with dry brush-wood: which, as it burns away, should be renewed, especially in those parts where the fire slackens in the logs. The whole pile may, likewise, from time to time, be covered with brush-wood, and boughs of trees with the leaves on them: the smothering effect of which is beneficial to the product of alkaline salt. When the fire is suffered to decline, and the whole is nearly consumed, all the remaining pieces of charcoal, or unburnt parts of the wood, should be carefully raked together from the extremities, to be thrown on the middle of the fire: and, indeed, the exterior part of the ashes themselves should be so treated; and some fresh dry brush-wood added, if necessary, to complete the incineration, or thorough reduction to ashes of the whole. It is extremely material, that this be effectually performed: and that all unburnt parts of the wood or charcoal formed in the burning, be separated from the ashes; and either burnt or taken away. For, from a neglect of this, not only the last part of the evaporation of the ley is made tedious, and difficult; but the pot-ash itself depraved, and rendered unfit for bleaching,

and

and some other uses, as well by its staining as caustic qualities. On this account, it is, also, proper, after the incineration, to free the ashes from any remaining impurities, by screening them through a wire-grate, that will suffer only the powdery matter to pass through.

Where less quantities of wood are to be consumed, or when the work is required to be carried on in wet weather, the wood may be most commodiously burnt on a kiln or grate. The kiln may be formed of a hollow square of brick work, with strong iron bars fixed horizontally across it, at about three feet from the ground; the front of the square being open below the bars, for the access of air. The square of brick-work may rise three or four feet above the bars. A grate may, otherwise, be formed, by laying a frame with bars over a hollow square of brick-work, of three feet high, with the front open. Or the frame and bars may be made to be portable, and supported only by bricks or stones, at the four corners, over a flooring of bricks or flat stones. The same general rules should be observed in burning the wood, and managing the fire and ashes, when the kiln, or grate are employed, as are above given in speaking of the manner of burning the wood on the ground.

The ashes being perfectly burnt and cleansed, should be preserved from rain, or from the access of any water, which may wash out, and consequently

consequently waste the salts. Where it can be conveniently practised, they may, nevertheless, be sprinkled slightly with water: and laid by in large heaps for some time; which will render the pot-ash more mild, and free from the caustic oil. But this is not indispensibly necessary, where the ashes are properly burnt, and thoroughly cleaned from bits of charcoal, or half consumed wood.

Where ashes are procured from fires burnt for domestic or other common purposes, and not intentionally for making pot-ash, they can rarely be depended on for the producing such as are fine. But in order to prepare them for affording the best they are capable of yielding without extraordinary trouble, they should be freed from all bits of charcoal; unburnt or half burnt wood; or other vegetable matter, by means of the rake above described; or, what is more effectual, by screening them through a wire grate: and then they should be preserved for use, as the foregoing.

The method of extracting the alkaline salt, or pot-ash, from the wood ashes thus prepared, is the same whether fine, or coarse, be proposed to be obtained: as the difference of goodness must arise principally from the purity of the ashes. The rest depends on the putting in execution properly the following directions.

The alkaline salt is first to be extracted from the ashes by means of water; and the fluid,
consisting

consisting of such salt, and the water, is called a *ley*: which is to be thus done. Put the ashes into one of the vessels, or steepers, above described; the lattice or grate of which must be first covered with coarse wheaten or rye straw, about the thickness of a foot; and, in this steeper, they must be well rammed together, as they are put in. When the steeper is so filled with them, let the surface be hollowed towards the middle, so as to form, as it were, a basin to receive the water to be poured in. This basin-like hollow may be four or five inches deep; and must not extend quite to the edge of the steeper; but leave a small margin or shoulder of the ashes, to prevent the water from flowing to the sides of the steeper, and finding a passage there; instead of soaking equally through the whole mass.

Then fill the basin, or hollow formed in the ashes, with soft water: and, as it sinks into them, supply more, as long as they will imbibe it. After standing thus a day or two, according to the magnitude of the steeper, turn the cock at the bottom of it; and draw off, into the receiver mentioned above, the fluid: which will now, the salts being dissolved in the water, become a *ley*. Remove the receiver, when the whole of this fluid is discharged: and put fresh water on the ashes, from time to time, till what runs off be void of taste or smell. But this latter running must be kept separate from the *ley* first drawn off.

By this means, a stronger and weaker kind of ley will be obtained: which must be put into proper vats: and if the strong contain a sufficient proportion of salt, it will be ready for evaporation. To know this, the most certain method is, to weigh it against other ley made of the due degree of strength: which may be most easily practised by filling two phials of equal measure and weight, with each kind; and observing the sameness, or difference of weight, after they are thus filled. But it is not required, that this ley should be of any precise standard, as to its strength: only that it should be as strong as it can conveniently be made, to save time in the evaporation. A moderate deficiency of strength, therefore, may be allowed; as the trouble occasioned by bringing it to the full degree, would be greater than that of evaporating the redundant water. If it will float an egg, it may be suffered to pass, where there is no inconvenience in prolonging the evaporation. When, however, the first ley is found too weak, it must be put on fresh ashes; and drawn off as before directed, till it be become of due strength. The weaker ley, or second running, must, also, be put on fresh ashes, for the same reason, and in the same manner; and if no ashes be ready at the time, it must be kept till a fresh quantity be obtained.

The ley, being thus prepared, must be put into the caldron to evaporate: to perform which, the fire must be kept as strong as it may, without

without occasioning the fluid to boil over : and as the quantity decreases, fresh ley must be put in to supply the waste. When a different caldron is used, as above advised, to complete the drying and purifying the alkaline salt, it must be taken out of the evaporating caldron, as soon as a proper quantity begins to form at the bottom. This must, also, be repeated, by means of the iron ladle, as fresh quantities of the salt form, till the lesser caldron will receive no more, without being above four-fifths full. The fire must then be kept moderate under this caldron : and the salt stirred up from the bottom, by the ladle or iron rod, till the remaining water be evaporated ; to avoid the explosive bubbling, that will otherwise arise, and throw part of the salt out of the vessel. The heat must therefore, be gradually increased, till all ebullition cease ; and then it must be augmented and kept up, to as great a degree, as the furnace will admit, till the whole operation be finished.

Where the ashes have been carefully burnt, and rendered sufficiently pure to make fine potash, after continuing this degree of heat for some hours, the salt, which till then remained fluid, with a dark brown or blackish colour, will at length concrete into a solid mass ; or, if the heat be very great, into a paste-like substance ; of a whitish, grey, or marbled colour. This will be a longer or shorter time, according to the purity of the ashes, with respect to the

burnt oil or vegetable sulphur: but it will frequently require twenty or twenty-four hours, or sometimes even more. When the salt is brought to this state, the fire may be discontinued; the furnace suffered to cool; and the alkali or pot-ash afterwards cut out of the caldron, by means of the chisel and mallet abovementioned: and it must then be put into casks, well secured from air or moisture.

Where ashes are not burnt intentionally for this purpose of making pot-ash; and it is proposed only to make the coarser kind; the same method must, nevertheless, be observed: except, that after continuing the heat for twenty or twenty-four hours, the fire, though the salt will yet remain in a fluid state with a black pitch-like appearance, may be suffered to go down: and the salt laded out into any shallow cold iron vessel; or poured on a stone floor; in order to save the trouble of cutting it out of the pot, when grown hard: and it must then be immediately put into proper casks, as above.

Where only one kind of caldron, of the form abovementioned, is used for both evaporating and calcining or purifying the alkaline salt, it must be supplied with ley, as the water evaporates, till it appear to be about four-fifths full of the concreted salt: and then the proceedings must be the same, as where the two separate caldrons for evaporating, and calcining or purifying, are employed.

P R O C E S S

P R O C E S S
F O R M A K I N G
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W I T H T H E

Method of obtaining, and preparing, the
Spanish K A L I for that Purpose.

BARILLA is a kind of alkali or pot-ash obtained by burning an herb called the SPANISH KALI ; and is applied to some of the same uses as common pot-ash, in making sope, glafs, &c.

The kali, though an annual plant, will, when once sown, spontaneously renew and propagate itself from its seed ; and from this wild produce a considerable part of the barilla is made in Spain and the Levant : where the plant is found naturally on sandy waste places on the sea-coast. But it may be, also, easily produced by culture : and must, indeed, be so produced, where great quantities are wanted for manufactures of the barilla.

The seed of the kali may be obtained from Spain ; as it is now commonly sold there : and it may be spread on sandy tracts of land, that lye waste on the sea-shore ; where it will maintain itself, provided the whole of the plants be not gathered

gathered for the barilla before the seed fall; or be not otherwise purposely destroyed. But it may, also, be sown on cultivated lands with advantage, along with corn; particularly with the kinds early ripe: as the kali will only be rising out of the ground when the corn is ready to be reaped; and does not attain to its maturity till late in the autumn. So that the one does no injury to the other, by their being raised together on the same ground.

Where kali is sown on large waste tracts of sandy land, it may be sufficient to strew the seed in the spring at any time when rain is expected. But, where it is to be raised in cultivated fields, it may be sown together with corn: and, in this case, when it is reaped for burning, care must be taken to save a due quantity of seed. This must be done, by shaking the herb over a piece of coarse canvas or sackcloth, placed to receive it, when such of the fruit, as is very ripe, will fall off; and by stripping, with the hand, from some of the mature plants, such additional quantity as may be wanted.

The herb is most fit for burning, in order to make the barilla, when it is in its decline; or after the greatest part of the seed is perfected: and it may be collected, or reaped, by drawing the plants out of the ground where they grow thinly, as on waste lands; or by mowing where there is a full crop, as when raised on cultivated land.

After

After the herb is drawn or mowed, it must be dried: which may be effected by treating it in the same manner as grass for hay: and it is of sufficient dryness, when so much of the succulent moisture is exhaled, that it will readily burn. A greater dryness, such as may be caused by a too long exposure to the sun in hot countries, is injurious to the kali for this purpose: as it makes the dried herb burn too rapidly; which would both lessen the quantity of the alkaline salt produced; and deprave the qualities of the barilla in other respects.

In order to burn the herb, when thus prepared, a large hole must be made in the ground; and formed, by such bricks and mortar as will bear a strong heat, into a kiln. The cavity of it may be of the figure of an egg. It must have two openings: one at the top, large enough to admit of the herb's being put into it, in order to its being burnt; and the barilla's being taken out after the burning is performed: and another placed somewhat above the bottom, passing horizontally into it, in order to suffer a draught of air to be made for supporting the fire. This last opening must, also, be made capable of being closely stopt, when it may be proper to suppress or extinguish the fire.

The herb must be, first, tied up in bundles as close and dense as they can be formed; and as large as can be thrust into the upper hole:

Then

Then one of them, being set on fire, must be put into the cavity of the kiln; and the rest must be likewise thrust in, as soon after each other as is practicable without extinguishing the fire. The openings into the cavity must immediately after this be closed, both above and below, so as to leave no greater passage for air than will be just sufficient to keep the fire alive: and, in such state the herb must be suffered to burn till the smoke appear to diminish considerably. A freer passage must be then given to the air through the two openings; and the fire allowed to burn briskly; or even assisted by some fresh bundles, if it will not rise strongly otherwise: and this must be continued till the whole matter, that will burn, be perfectly consumed; and the remaining part reduced to the state of ashes or a calx. After this, both the openings must be closed till the kiln be sufficiently cooled to suffer the incinerated mass or calx in its bottom to be taken out.

This mass of ashes, or calx, is the barilla: which, if the operation has been rightly performed, will appear in the form of a cake: of a hard consistence: of a blueish grey colour throughout: free from any offensive smell when moistened: and having little holes, imagined to be like *partridge-eyes*, from whence the best kind has taken its name.

The

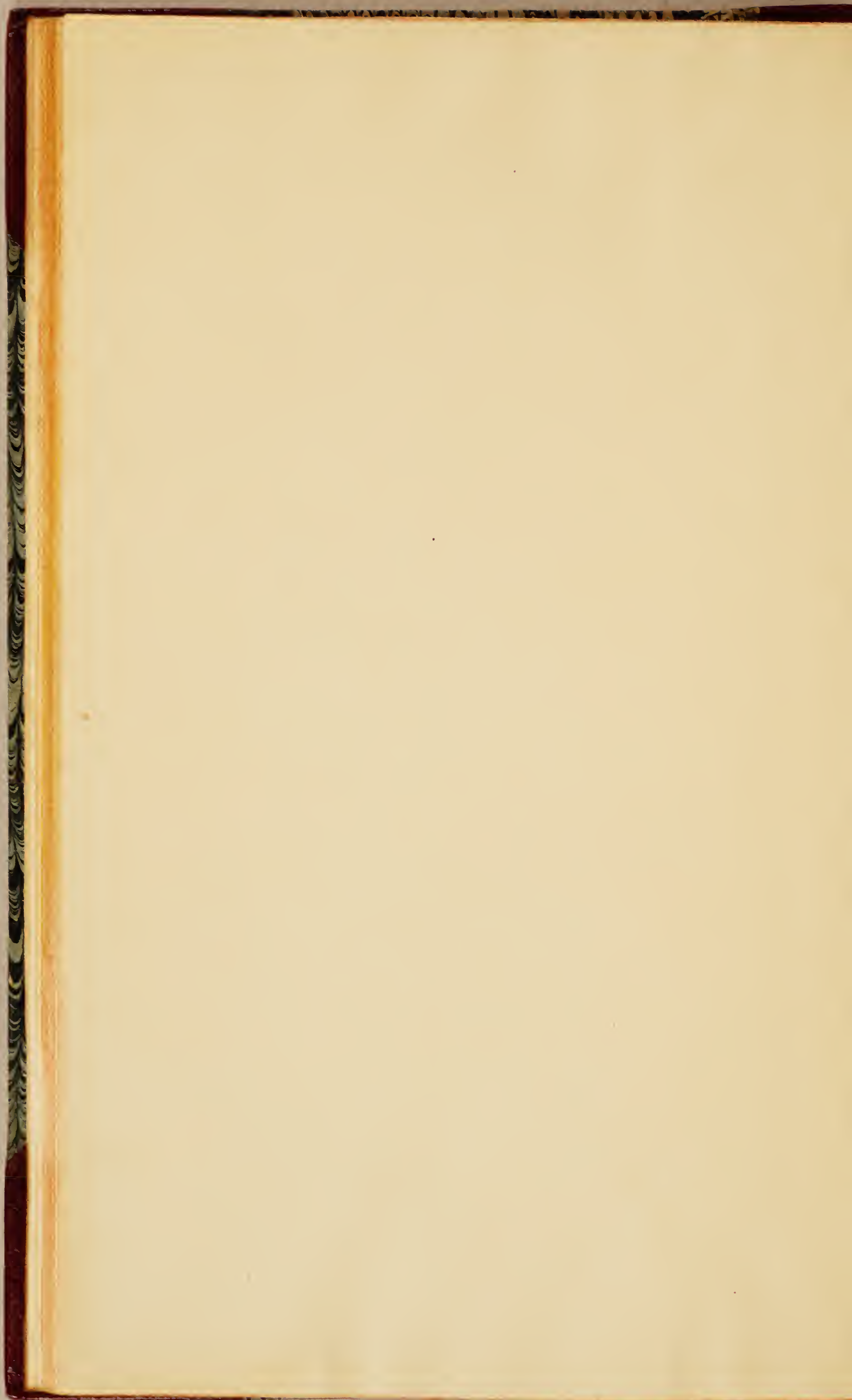
The cake must be then broken; taken out of the kiln; and packed up in tight casks.

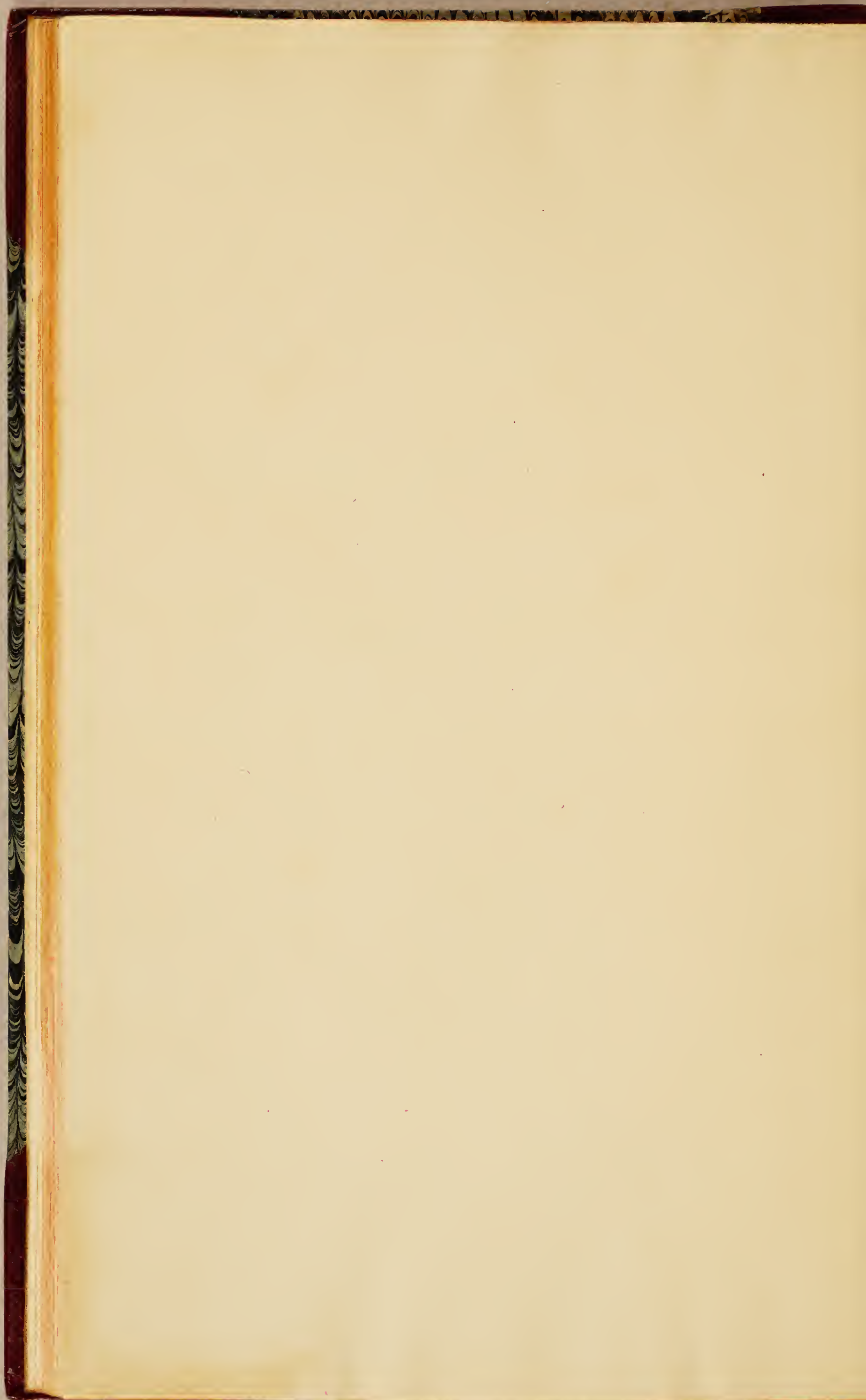
The present price of the best, or *partridge-eye barilla*, is from about fifteen to eighteen pounds per ton.

N. B. Other species of the *kali*, or *glass-wort*, as well as the *Spanish*, will afford barilla, by the same treatment: and it is presumed, that there are other kinds of plants, as well as the *kali*, growing on the sea-shore in North America, that would be found, on due trial, to be capable of being profitably applied to the same purpose.

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